The average value for the potential gradient in the Atlantic Ocean was about equal to that in the Pacific and about 60 per cent. greater than the value in the Indian Ocean. With the exception of one observation the potential gradient was always positive when even the observations were made during rain. The relations of the elements among themselves and with the various meteorological factors is in accordance with what would be expected from theoretical considerations.

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A Sensitive Moving-Coil Galvanometer.[1]

By F. Wenner, E. Weibel and F. C. Weaver.

The galvanometer is designed for use in bridge, potentiometer, and similar work where the resistance of the apparatus is fairly low and a high sensitivity is required. To distinguish the design described here from others we shall refer to it as type *m*.

The coil is 8 × 12 mm. in mean area and has $27\frac{1}{2}$ turns of .080 mm. (No. 40 American wire gauge) single silk-covered copper wire. It is wound in such a way that there is a loop at both the top and bottom to which the suspensions and mirror are attached. A second loop is brought out both at the top and the bottom and extends to the front. These with a wire added later form a truss to stiffen the coil. Before the coil is removed from the form on which is is wound it is treated chemically to remove all traces of iron in the insulation and on the surface of the wire. After thorough washing and drying the coil, still on the form, is dipped in a thin solution of collodion which when dry binds the winding firmly together.

The mirror is 1 cm. in diameter and .6 mm. in thickness.

The suspensions are made from .015 mm. copper wire rolled flat. They are each about 4 cm. long and by means of a spring are held taut, the tension being of the order of 1,000 dynes.

The point to which the lower end of the lower suspension is attached is not directly under the point to which the upper end of the upper suspension is attached, but is from 1 to 3 mm. to the front. Thus the coil rotates about an axis making a small angle with the vertical. In balancing the coil the adjustment is made so that the center of mass is a fraction of a mm. to the front of the axis of rotation. This gives the moving system a small gravity control opposing the control of the suspensions. By changing the level of the instrument the gravity control may be changed and consequently the period of the moving system changed as desired.

The iron core is 6 mm. in diameter and 1 cm. long. The pole pieces are of the same length as the core and have a radius of 4 mm. In assembling the spacing is such that the air gaps are 2 mm. at the center and slightly less under the pole tips, making the field very nearly radial.

[1] Abstract of a paper presented at the Washington meeting of the Physical Society, April 24–25, 1914.

A strong magnet is used and it is provided with an adjustable shunt so that the intensity of the field in the air gap can easily be varied over a considerable range.

With the period adjusted to 10 seconds and the field strength adjusted so as to make the external critical resistance 20 ohms the sensitivity is approximately 20 mm. per micro-volt, with the scale at a distance of 1 meter.

As compared with the most sensitive "low resistance" galvanometers on the market, taking the mean of the operating constants of three instruments of different designs, we have, approximately—external critical resistance 65 ohms —period 6 seconds—and sensitivity 2 mm. per micro-volt.

It is probable that further experience with this design will suggest minor changes in the construction.

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THE CONTROL OF THE WAVE-LENGTH-SENSIBILITY CURVES FOR SELENIUM.[1]

BY E. O. DIETERICH.

AN investigation of the conditions governing the shape of the sensibility curves for selenium led to the production of several new types of cells, which may be classified into two general groups; those that have a maximum sensibility for wave-lengths longer than 640 $\mu\mu$, and those that show very little sensitiveness in this region, but have a maximum for wave-lengths shorter than 640 $\mu\mu$. The location of the maximum for the different types produced thus far is as follows: 440 $\mu\mu$, 500 $\mu\mu$, 550 $\mu\mu$, 700 $\mu\mu$, 720 $\mu\mu$, and 800 $\mu\mu$. Those that show a maximum in the red also have a pronounced minimum at 640 $\mu\mu$, and a broad maximum at the shorter wave-lengths. Some, however, have two well-defined maxima; those that have a maximum at 440 $\mu\mu$ also show one at 700 $\mu\mu$ or 720 $\mu\mu$, and a minimum at 640 $\mu\mu$.

The location of the maximum seems to be determined entirely by the method of "annealing" the cells. The samples annealed at 210° C., or higher, all show a maximum below 640 $\mu\mu$, and no maximum at all in the longer wave-lengths. Those annealed at lower temperatures, 180° C., all show a maximum at wave-lengths greater than 640 $\mu\mu$, which is higher than the broad, undefined maximum in the shorter wave-lengths. When the samples are annealed at temperatures between 180° C. and 210° C., the height of the maximum in the red, relative to that in the blue, becomes less and less, until at about 210° C. it disappears. Further work, to determine more accurately the governing conditions, is in progress.

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THE TESTING OF POTENTIOMETERS.[1]

BY FRANK WENNER AND ERNEST WEIBEL.

FOR precise measurements with a potentiometer the errors in the adjustment of the resistance sections or coils in the apparatus must be known.

[1] Abstract of a paper presented at the Washington meeting of the Physical Society, April 24–25, 1914. To be published in the Bulletin of the Bureau of Standards and reprinted as Scientific Paper No. 223.